REMARKS

In the Office Action dated September 9, 2004, the disclosure of the above-identified patent application was objected to for failing to provide serial numbers of related U.S. patent applications that were unknown at the time of filing of the present application. The above amendment amends the specification to update and correct the references to the related U.S. patent applications. In view of the amendment, Applicants request reconsideration and withdrawal of the objection to the specification.

Claims 1-37 were pending in the above-identified application when last examined and are amended as indicated above. The claim amendments clarify the claim language and are not intended to limit the scope of the claims, unless the claim language is expressly quoted in the following remarks to distinguish over the art cited.

Claim 20 was rejected under 35 U.S.C. § 112, second paragraph as lacking antecedent bases for "the semiconductor region" and "the ferromagnetic-semiconductor junctions." In response, claim 20 is amended to replace "the semiconductor region" and "the ferromagnetic-semiconductor junctions" respectively with "the control region" and "the first and second interfaces," which have antecedent bases in claim 1. In view of the above amendments, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Claims 1, 2, 9, 10, 13, 28, and 29 were rejected under 35 U.S.C. § 102(b) as anticipated by "Spintronics," American Scientist, Vol. 89, pp 516-523 (2001), hereinafter referred to as Sarma. Applicants respectfully traverse the rejection.

Independent claim 1 distinguishes over Sarma at least by reciting, "a wire positioned relative to the control region so that a current through the wire creates in the control region a magnetic field that rotates spins of the electrons injected through the control region." Sarma fails to suggest electron spins interacting with a magnetic field produced by a current through a wire.

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Sarma in Fig. 3 illustrates a spin transistor commonly known as the Datta-Das spin transistor. The Datta-Das spin transistor as illustrated in Sarma includes a ferromagnetic emitter and a ferromagnetic collector with a thin intervening channel. A gate voltage, e.g., gate V in Fig. 3, controls the flow of spin-polarized electrons through the channel. In particular, the caption of Fig. 3 in Sarma describes operation of the spin transistor as follows: "With the gate voltage off, the aligned spins pass through the channel and are

collected at the other side... With the gate voltage on, the field produces magnetic interaction that causes the spins to precess... If the spins are not aligned with the direction of the magnetization of the collector, no current can pass."

The interaction that Sarma loosely refers to as being a magnetic interaction is actually a spin-orbit interaction that is commonly known as the Rashba interaction. Spin-orbit interactions arise when a particle with spin (e.g., an electron) moves through an electric field, for example, when an electron orbits through the static electric field of a nucleus or the spin-polarized electrons in the Datta-Das spin transistor traverse the electric field arising from an applied gate voltage. Despite Sarma's reference to a magnetic interaction, the gate voltage in the Datta-Das spin transistor only produces an electric field and does not produce a magnetic field. The weak spin-orbit coupling of the spin of the electron to the electric field (i.e., the Rashba interaction) rotates the spin of an electron. Accordingly, Sarma fails to disclose or suggest "a current through the wire creates ... a magnetic field that rotates spins of the electrons" as recited in claim 1 because the spin transistor Sarma discloses relies on spin-orbit interactions and employs a gate voltage (not a current) to create an electric field (not a magnetic field). Claim 1 is thus patentable over Sarma.

Claims 2, 9, 10, 13, 28, and 29 depend from claim 1 and are patentable over Sarma for at least the same reasons that claim 1 is patentable over Sarma.

For the above reasons, Applicants request reconsideration and withdrawal of the rejection under 35 U.S.C. § 102.

Claims 11, 12, 14, and 15 were rejected under 35 U.S.C. § 103(a) as unpatentable over Sarma. Applicants respectfully traverse the rejection.

Claims 11, 12, 14, and 15 depend from claim 1, which is patentable over Sarma for at least the reasons given above. Accordingly, claims 11, 12, 14, and 15 are similarly patentable over Sarma, and Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 103.

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Claims 3-8, 16-19, 21-27, 30 and 31 were objected to as dependent upon a rejected claim but were indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 3-8, 16-19, 21-27, 30, and 31 remain dependent from claim 1 but are believed patentable for at least the same reasons that claim 1 is patentable. Accordingly, Applicants request reconsideration and withdrawal of the objection to claims 3-8, 16-19, 21-27, 30, and 31.

Claims 32-37 were allowed.

In summary, claims 1-37 were pending in the application. Claims 32-37 were allowed. This response amends claims 1, 19, 20, 28, and 36 to improve their form or correct errors. For the above reasons, Applicants respectfully request allowance of the application including claims 1-37.

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